

Editorial Board Members

Joaquim Filipe 

Polytechnic Institute of Setúbal, Setúbal, Portugal

Ashish Ghosh

Indian Statistical Institute, Kolkata, India

Raquel Oliveira Prates 

Federal University of Minas Gerais (UFMG), Belo Horizonte, Brazil

Lizhu Zhou

Tsinghua University, Beijing, China


More information about this series at <http://www.springer.com/series/7899>

Zhiping Cai · Jian Li · Jialin Zhang (Eds.)

Theoretical Computer Science

39th National Conference
of Theoretical Computer Science, NCTCS 2021
Yinchuan, China, July 23–25, 2021
Revised Selected Papers

Editors

Zhiping Cai 
National University of Defense Technology
Changsha, China

Jian Li
Tsinghua University
Beijing, China

Jialin Zhang
Chinese Academy of Sciences
Beijing, China

ISSN 1865-0929 ISSN 1865-0937 (electronic)
Communications in Computer and Information Science
ISBN 978-981-16-7442-6 ISBN 978-981-16-7443-3 (eBook)
<https://doi.org/10.1007/978-981-16-7443-3>

© Springer Nature Singapore Pte Ltd. 2021

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Preface

The National Conference of Theoretical Computer Science (NCTCS) has become one of the most important academic platforms for theoretical computer science in China. So far, NCTCS has been successfully held in more than 20 regions of China, providing a place for exchange and cooperation for researchers in theoretical computer science and related fields.

NCTCS 2021 was hosted by the China Computer Federation (CCF) and organized by the Theoretical Computer Science Committee of China Computer Society and the College of Computer Science and Engineering of North Munzu University. It took place during July 23–25, 2021, in Yinchuan, Ningxia. This conference invited famous scholars in the field of theoretical computer science to give presentations, and it included a wide range of academic activities and showed the latest research results. In total, 397 people registered for NCTCS 2021, of which 353 authors submitted 145 papers (67 papers were finally accepted). We invited 82 reviewers from colleges and universities to undertake the peer review process (single blind), where the average number of papers assigned to a reviewer was five and the average number of reviews per paper was three. All papers were managed using the online submission system (CCF Consys), more details can be seen on the conference website: <https://conf.ccf.org.cn/TCS2021>.

This volume contains 14 of the accepted papers, which have been arranged under five topical headings (Information Hiding, Data Detection and Recognition, System Scheduling, Time Series Prediction, Formal Analysis).

The proceedings editors wish to thank the dedicated Program Committee members and external reviewers for their hard work in reviewing and selecting papers. We also thank Springer for their trust and for publishing the proceedings of NCTCS 2021.

September 2021

Zhiping Cai
Jian Li
Jialin Zhang

Organization

General Chairs

Xiaoming Sun	Chinese Academy of Sciences, China
Wenxing Bao	North Minzu University, China

Program Committee Chairs

Zhiping Cai	National University of Defense Technology, China
Jian Li	Tsinghua University, China
Jialin Zhang	Chinese Academy of Sciences, China

Steering Committee

Xiaoming Sun	Chinese Academy of Sciences, China
Jianping Yin	Dongguan University of Technology, China
Lian Li	Hefei University of Technology, China
En Zhu	National University of Defense Technology, China
Kun He	Huazhong University of Science and Technology, China

Program Committee

Juan Chen	National University of Defense Technology, China
Jianxi Fan	Soochow University, China
Qilong Feng	Central South University, China
Xin Han	Dalian University of Technology, China
Kun He	Huazhong University of Science and Technology, China
Zhaoming Huang	Guangxi Medical University, China
Lvzhou Li	Sun Yat-sen University, China
Zhanshan Li	Jilin University, China
Hao Liao	Shenzhen University, China
Qiang Liu	National University of Defense Technology, China
Xingwu Liu	Chinese Academy of Sciences, China
Zhengyang Liu	Beijing Institute of Technology, China
Lei Luo	National University of Defense Technology, China
Rui Mao	Shenzhen University/Shenzhen Institute of Computing Science, China
Zhengwei Qi	Shanghai Jiao Tong University, China
Feng Qin	Jiangxi Normal University, China
Guojing Tian	Chinese Academy of Sciences, China

Gang Wang	Nankai University, China
Nan Wu	Nanjing University, China
Mengji Xia	Institute of Software, Chinese Academy of Sciences, China
Mingyu Xiao	University of Electronic Science and Technology, China
Tao Xiao	Huawei Theoretical Computer Laboratory, China
Huanlai Xing	Southwest Jiaotong University, China
Yicheng Xu	Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences, China
Jinyun Xue	Jiangxi Normal University, China
Tian Yang	Central South University of Forestry and Technology, China
Yitong Yin	Nanjing University, China
Peng Zhang	Shandong University, China
Yong Zhang	Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences, China
Zhao Zhang	Zhejiang Normal University, China
Cheng Zhong	Guangxi University, China
Xinzhong Zhu	Zhejiang Normal University, China
En Zhu	National University of Defense Technology, China

Additional Reviewers

Chau Vincent	Lv Shuai
Kerong Ben	Bo Ning
Dongbo Bu	Dantong Ouyang
Qingqiong Cai	Haiyu Pan
Shaowei Cai	Zhiyong Peng
Yongzhi Cao	Jiaohua Qin
Pei Chen	Feng Shi
Yujia Chen	Xiaoming Sun
Zhigang Chen	Chang Tang
Zhiguo Fu	Zhihao Tang
Lengxiao Huang	Changjing Wang
Shenwei Huang	Meihua Xiao
Zhiyi Huang	Yun Xu
Haibin Kan	Yan Yang
Qian Li	Yu Yang
Wenjun Li	Penghui Yao
Huawen Liu	Mengting Yuan
Renren Liu	Chihao Zhang
Tian Liu	Jia Zhang
Xiaoguang Liu	Xiaoyan Zhang
Xinwang Liu	Changwang Zhang
Zhendong Liu	Zhengkang Zuo

Contents

Information Hiding

Research on Adaptive Video Steganography Algorithm for Clustering and Dispersing DCT Coefficient Difference Histogram	3
<i>Kun Han, Ke Niu, Shuai Yang, and XiaoYuan Yang</i>	

Coverless Image Information Hiding Based on Deep Convolution Features.	15
<i>Jiaohua Qin, Jing Wang, Jun Sun, Xuyu Xiang, and Lin Xiang</i>	

Data Detection and Recognition

Fusion and Visualization Design of Violence Detection and Geographic Video.	33
<i>Qiming Liang, Chuanqi Cheng, Yong Li, Kaikai Yang, and Bowei Chen</i>	

A New RGB-D Gesture Video Dataset and Its Benchmark Evaluations on Light-Weighted Networks	47
<i>Guojian Xiao, Zhendong Lu, Zhirong Yang, Panji Jin, Kuan Li, and Jianping Yin</i>	

The High Precision Real-Time Facial Landmark Detection Technique Based on ShufflenetV2	59
<i>Shulin Lv, Jie Liu, Chunye Gong, Bo Yang, and Xinbiao Gan</i>	

System Scheduling

Computation Tree Logic Model Checking over Possibilistic Decision Processes Under Finite-Memory Scheduler.	75
<i>Wuniu Liu, Qing He, and Yongming Li</i>	

A Survey of Real-Time Scheduling on Multiprocessor Systems	89
<i>Zhenyu Sun, Mengying Guo, and Xingwu Liu</i>	

Encryption Traceability Scheme Based on SGX and Blockchain	119
<i>Yunong Dai and Baixiang Liu</i>	

Time Series Prediction

A Load Forecasting Method of Power Grid Host Based on SARIMA-GRU Model	135
<i>Chen Zheng, Yuzhou Wu, Zhigang Chen, Kun Wang, and Lizhong Zhang</i>	

DWAFE: Achieve Accurate AIOps Fault Early Warning 154
Yuan Tan, Jinsong Gui, Kun Wang, and Zhigang Chen

Formal Analysis

The Distribution of Edge-Frequencies Computed with Frequency
Quadrilaterals for Traveling Salesman Problem 177
Yong Wang and Ruobing Shen

Evaluating Performance, Power and Energy of Deep Neural Networks
on CPUs and GPUs. 196
*Yuyang Sun, Zhixin Ou, Juan Chen, Xinxin Qi, Yifei Guo, Shunzhe Cai,
and Xiaoming Yan*

Proving Mutual Authentication Property of 5G-AKA Protocol Based
on PCL 222
Tong Zhang, Meihua Xiao, and Ri Ouyang

Research on the Model Transformation Method and Application of Formal
Model Driven Engineering (FMDE) 234
Ya Liu, Jinyun Xue, Zhiheng Zhang, Yang Liu, and Hongwen Hu

Author Index 255